

CENTER STATUS UPDATE

NASA Langley Research Center

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GSFC, Greenbelt, MD
Coastal Climate Change Workshop
MASTER PLANNING COMMUNITY FACE-TO-FACE

“The Chesapeake Bay region is one of the most vulnerable areas in the nation to sea level rise induced by climate change. Bay waters are already rising due to climate change and land subsidence. This combination increases the relative rate of sea level rise in the region: during the last century, the relative sea level has risen approximately one foot in the Chesapeake, nearly twice the global average. Scientists predict that the bay’s relative sea level could rise anywhere from 1.3 feet to 5.2 feet by the end of this century. Of greater immediate concern is flooding from tropical storms, hurricanes and nor’easters. Storm surge associated with extreme weather events will threaten both natural and human infrastructure in the bay.”

THE CONSERVATION FUND



PROCESS FOR ASSESSING CLIMATE RISKS TO CENTER ASSETS



How we assessed Center assets to determine climate risks:

- Identified the most likely types of climate change risks:
 - Increased storm activity and a higher frequency of severe storms and related storm damage (hurricanes, Nor'easters, thunderstorms, tornados, heavy rain, sleet, snow, etc.)
 - Storm surge – related to increased storm activity but due to potential impacts, it should be addressed separately
 - Sea-level rise and coastal flooding
 - Extreme temperatures and longer durations of extreme heat
- Ran several different storm scenarios to identify the facilities and infrastructure that are the most vulnerable
- Reviewed historical records of previous storms and the resulting damage to look for trends and lessons learned

PROCESS FOR ASSESSING CLIMATE RISKS TO CENTER ASSETS



How we assessed Center assets to determine climate risks:

- Effort is complete, on-going, just starting?
 - Many ongoing activities to provide more accurate data and identify the proper criteria for making better decisions as we move forward
- How we are prioritizing our list of assets at risk:
 - ViTAL Team Report
 - Determined which of the at-risk facilities are mission critical
 - Estimated the life-expectancy of the facilities and the long term need for the capabilities provided within each facility
 - Compare the results of the weather scenarios with the list of most critical facilities and infrastructure
 - Estimate the cost of different levels of prevention and examine where those fit into our new tiered maintenance approach – *can we mitigate some of the risks?*
 - Provide a cost/benefit risk analysis for critical facilities and infrastructure



CHIEF CLIMATE IMPACTS OF CONCERN



Based on adaptation workshop or other vulnerability assessment, we identified the following infrastructure risks:

CLIMATE FACTOR	RISK	TIMEFRAME	
Higher frequency of severe storms	<ul style="list-style-type: none">• East-side facility damage• Power outages• Substations/Transformers/HVAC systems• Wind damage	Current	
Storm surge causing periodic severe flooding	Deteriorating electrical distribution systems and communication systems within the underground utility tunnels. When flooded, the salinity increases and accelerates deterioration.	2020	
Sea-level rise and coastal flooding	Complete inundation of some buildings	2040	
Extreme temperatures and longer durations of extreme heat	<ul style="list-style-type: none">• Availability of power from electricity provider• Increased demand on HVAC systems	Current (however, the risk escalates over time)	



SPECIFIC RISKS



Specific Infrastructure Assets at Risk (and why we're concerned):

- Horizontal infrastructure and miles of underground utility tunnels that could be inundated from an especially strong storm surge or other coastal flooding
- Deteriorating electrical distribution system
 - Even though have been proactive with replacement projects and have elevated many electrical systems in the East Area, we still have to contend with various outdated substations, transformers, etc.
 - East-side facilities are more vulnerable and exposed
 - Transonic Dynamics Tunnel
 - Vertical Spin Tunnel

These facilities have increased risk for corrosion of the steel structures and flooding of lower elevation building electrical systems

OTHER IMPORTANT NON-INFRASTRUCTURE RISKS?



Other Climate Risks to Natural Resource or Community assets that have the Center's or the public's attention:

- Damage to, and shrinking estuaries, wetlands and other natural habitat
- Coastal shoreline erosion
- Disappearing native wildlife
- Invasive species
- Storm water systems and flood control
 - Minimize environmental damage due to flooding
 - Minimize residential flooding in neighboring cities



INFORMATION GATHERING OR OTHER EFFORTS TO ASSESS RISK OR PLAN ADAPTATION



What we're doing now:

- Submitting a package of storm-hardening projects based on the LaRC “Wind and Storm” study done in 2011:
 - Electrical substation protection, utility tunnel upgrades, HVAC system upgrades
 - Perimeter flood barrier for facilities on the east side
 - Building hardening
 - Storm water analysis and upgrades
- Designing and implementing a new 22KV redundant electrical loop distribution system. The goal is to increase the Center’s electrical distribution system reliability and maintainability by gradually eliminating the antiquated 2.4KV and 6.9K infrastructure
- Performing a detailed geodetic control and topographic survey, which includes LiDAR and photogrammetric elevation data sets.
- Obtaining new elevation measurements for most LaRC facilities, and then translating our “local” elevations to a new contemporary vertical datum.
- Refining our Flood Impact Analysis tool; allowing web users to input flood prediction levels and visualize the impact to LaRC facilities and utilities. The tool also provides information on depth of water at various tidal datum (mean low, mean high, etc.)



INFORMATION GATHERING OR OTHER EFFORTS TO ASSESS RISK OR PLAN ADAPTATION



What we're doing now:

- Making our Flood Impact Analysis Tool available for use by others:
 - Langley Air Force Base
 - After use of the tool for just one storm LaRC received an award based on reported AF savings in excess of \$1M thanks to a more efficient deployment of resources to combat the flooding.
 - Supporting refinement of the Flood Analysis Tool to 1) incorporate efficient sandbag distribution when preparing for a storm, and 2) have the ability to track other storm-related labor resources for any given flood event.
 - City of Poquoson
 - Extending the functionality of the Flood Tool to analyze sections of roads that may be impassible during various stages of flooding; especially important for emergency vehicles
 - City of Hampton and the Fort Monroe Authority
 - Evaluating multiple forms of analysis capabilities based on various types of data.



CHALLENGES AND ACCOMPLISHMENTS



Challenges and accomplishments:

- Our biggest challenge thus far has been:
 - Consistent Funding
 - Storm Hardening project that was funded by the Administrator's 1% over guideline was cut in the FY14 Presidents submit
- Our best accomplishment thus far has been:
 - GIS flood prediction tool with enhanced capabilities
 - Successful funding for the first two phases of our new 22KV electrical distribution loop



OTHER CONSIDERATIONS



Climate-sensitive Health Outcomes:

- Identify the risks of climate-sensitive health outcomes
 - Indoor air quality
 - Increased mold and mildew
 - Water quality
 - Contingency plans for possible water contamination
 - Insect and pest control
 - Mosquitos, ticks, mice, snakes, etc.